Y3.N21/5:14/16

National Advisory Committee for Aeronautics

Research Abstracts

NO. 16

JANUARY 24, 1952

CURRENT NACA REPORTS

NACA TN 2556

BUCKLING OF RECTANGULAR SANDWICH PLATES SUBJECTED TO EDGEWISE COMPRESSION WITH LOADED EDGES SIMPLY SUPPORTED AND UNLOADED EDGES CLAMPED. Kuo Tai Yen, V. L. Salerno and N. J. Hoff, Polytechnic Institute of Brooklyn. January 1952. 66p. diagrs., tab. (NACA TN 2556)

The compressive stress for buckling is calculated for a rectangular flat sandwich plate with loaded edges simply supported and unloaded edges rigidly clamped. In the calculations Hoff's differential equations are integrated by Leggett's method to obtain lower bounds and by Galerkin's method to establish upper bounds. True values of the buckling stress are estimated as arithmetic means of these bounds and are presented in a diagram which covers the entire practical range of the geometric and mechanical quantities involved.

NACA TN 2567

DIRECT MEASUREMENTS OF SKIN FRICTION. Satish Dhawan, California Institute of Technology. January 1952. 60p. diagrs., photos. (NACA TN 2567)

A device was developed to measure local skin friction on a flat plate by measuring the force exerted on a very small movable part of the flat plate. The apparatus was applied to measurements in the low-speed range, for both laminar and turbulent boundary layers, and the measured skin-friction coefficients show excellent agreement with Blasius' and Von Kármán's results. Measurements were made in high-speed subsonic flow and turbulent-skin-friction coefficients were determined up to a Mach number of about 0.8. A few measurements were also made in supersonic flow.

NACA TN 2597

INVESTIGATION OF LAMINAR BOUNDARY LAYER IN COMPRESSIBLE FLUIDS USING THE CROCCO METHOD. E. R. Van Driest, North American Aviation, Inc. January 1952. 78p. diagrs., 3 tabs. (NACA TN 2597)

The Crocco method has been used to compute the skin-friction and heat-transfer coefficients for high-speed air flow in the laminar boundary layer on a flat plate, assuming a Prandtl number of 0.75 and constant specific heat, and using the Sutherland viscosity law. The results are different from those given by Crocco in that they are based on an ambient temperature of -67.6° F and extend the Mach number range considerably above 5 with variable wall-to-free-stream temperature ratio. Variation of shear, velocity, temperature, and Mach number across the layer are shown. The application of the Crocco method of laminar-boundary-layer analysis is discussed in detail.

NACA TN 2605

BEHAVIOR OF VORTEX SYSTEM BEHIND CRUCIFORM WINGS - MOTIONS OF FULLY ROLLED-UP VORTICES. Alvin H. Sacks. January 1952. 40p. photos., diagrs. (NACA TN 2605)

The motions of four fully rolled-up vortices representing the vortex system trailing behind cruciform wings (banked 45°) at all Mach numbers are investigated by theoretical and visual-flow methods. Equations are developed for the vortex paths in three dimensions, and the distance behind the wing at which the upper two vortices "leapfrog" through the lower two is calculated. Results of some water-tank tests are presented and comparisons made with the theory.

NACA RM 51K06

INVESTIGATION OF STRESSES DUE TO THERMAL GRADIENTS IN TYPICAL AIRCRAFT STRUCTURES. Martin E. Barzelay and James C. Boison, Syracuse University. January 1952. 90p. diagrs., photos., tab. (NACA RM 51K06)

Five 75S-T6 aluminum-alloy elementary skin and spar-cap combinations with skin varying from 0.051 to 0.500 inch in thickness were investigated to determine the temperature and stress gradients resulting from application of heat to the surface. The tests consisted of measuring the temperatures with thermocouples and the strains with bonded wire strain gages at selected points for three heating rates varying from 26,500 to 55,900 Btu per hour. The measured temperatures and stresses calculated from the measured strains are presented in tables. Curves present the effect of varying heating rate and skin thickness on temperature and stress variation with time, on temperature variation with stress, on chordwise temperature and stress distributions, and on temperature and stress differences between skin and spar cap.

---

*AVAILABLE ON LOAN ONLY.

ADDRESS REQUESTS FOR DOCUMENTS TO NACA, 1724 F ST., NW., WASHINGTON 25, D. C., CITING CODE NUMBER ABOVE EACH TITLE; THE REPORT TITLE AND AUTHOR.

NACA TM 1325

CONCERNING THE FLOW ABOUT RING-SHAPED COWLINGS OF FINITE THICKNESS. Part I. (Über die Strömung an ringförmigen Verkleidungen endlicher Dicke). Dietrich Kuchemann. January 1952. 24p. diagrs. (NACA TM 1325. Trans. from Zentrale für wissenschaftliches Berichtswesen über Luftfahrtforschung, Berlin. FB 1236, June 13, 1940).

It is shown how one may obtain, in a simple manner, the forms of ring-shaped bodies from existing tables of functions according to the customary method of superposition of flow due to singularities and parallel flow. A number of examples of the forms and pressure distributions of annular source bodies with and without hub body are given, and the inlet conditions of such ring-shaped cowlings are investigated. Furthermore, the annular bodies of finite length are indicated that correspond to Joukowsky profiles for the two-dimensional case. The examples are to give a basis for the design of cross-sectional forms of ring-shaped cowlings and a survey of the flows to be expected.

BRITISH REPORTS

N-11518*

Aeronautical Research Council (Gt. Brit.)
THE BOUNDARY-LAYER COOLING OF A FLAT PLATE; A CONTRIBUTION TO A DISCUSSION ON THE COOLING OF GAS TURBINE BLADES. R. E. Meyer. 1951. 14p. diagrs. (ARC R & M 2420. Formerly ARC 9571; FM 914; TJR 84)

The report deals with the turbulent boundary layer on a flat plate which is placed edgewise in a hot gas stream and cooled by the injection of air into the boundary layer. The velocity distribution can be calculated, to a reasonable approximation, in the same way as for isothermal flow if the velocity of the main stream and the difference between the temperature and that of the plate are not too high. German work is briefly considered.

N-11519*

Aeronautical Research Council (Gt. Brit.)
AIRCRAFT FLUTTER. J. Williams. 1951. 62p. (ARC R & M 2492)

General methods for the investigation of aircraft flutter, by theoretical analysis and by experiments on flutter models, are set out and discussed. Methods for the evaluation of the aerodynamic forces required in a theoretical flutter analysis are logically developed, and a bibliography of researches on the aerodynamic theory is given. Investigations on wing flutter, control surface flutter, and tab flutter are discussed. General conclusions are drawn, and ways of preventing these various types of flutter are considered, but the practical details of flutter-prevention devices are omitted. Methods for the experimental determination of air loads on oscillating airfoil systems are described, and available air load measurements are analyzed and compared with theoretical results.

N-11520*

Aeronautical Research Council (Gt. Brit.)
THE EFFECT OF CURRENT VARIATION ON THE OUT-OF-BALANCE OF STRAIN GUAGE BRIDGES. J. B. B. Owen. 1951. 5p. diagrs. (ARC R & M 2497; ARC 10, 456. Formerly RAE Tech. Note SME 389)

Gives test results showing that out-of-balance current in a Wheatstone bridge consisting of four unrestrained resistance strain gages increases at first in proportion to the applied bridge voltage. As the gage current increases, the out-of-balance current departs appreciably from this linear law by an amount approximately proportional to the cube of the gage current. Any errors in resistance compensation against temperature changes between gage and gage might be expected to increase with current squared and the consequent out-of-balance current in the galvanometer due to this effect as the current cubed.

N-11521*

Aeronautical Research Council (Gt. Brit.)
PROPOSAL FOR AN ELEVATOR MANOEUVRABILITY CRITERION. S. B. Gates. 1951. 15p. diagrs., tab. (ARC R & M 2677; ARC 5981. Formerly RAE Aero 1740)

The approximate theory of response to elevator developed by Bryant, Gandy, and Gates yields a compact formula for a criterion of maneuverability Q, the "stick force per increment in g"; there is an analogous but less useful criterion in terms of stick travel. It is recommended that Q be adopted for designers use, that its limits of validity be checked by careful tests on one airplane, and that more force measurements in pull-out from dives be made on a number of airplanes in order that numerical standards may be attached to Q. Reference is made to American standards and to experimental work already done in England. The rate of growth of acceleration is discussed and illustrated.

N-11524*

Aeronautical Research Council (Gt. Brit.)
TESTS OF MODEL PROPELLERS IN THE HIGH SPEED TUNNEL THRUST AND TORQUE MEASUREMENTS ON A 2-BLADE, 6 PER CENT. THICK, CLARK Y SECTION PROPELLER. G. S. Hislop and J. Caldwell. 1951. 44p. diagrs., photos., 3 tabs. (ARC R & M 2595; ARC 9408; ARC 11, 163. Formerly RAE Aero 2096)

The experimental technique for measurement of overall thrust and torque of model propellers in the RAE high speed tunnel is satisfactory and gives fairly consistent results. No appreciable scale effect was present on the tests made at low M, but no information is available as to a possible scale effect at high M. The thrust and torque coefficients and propulsive efficiency results at constant J show no variation of a serious nature from the characteristics to be expected from such a blade section operating at high M.

N-11525*

Aeronautical Research Council (Gt. Brit.)
ESTIMATION OF WING FLUTTER SPEEDS FROM THE CURVES OF R & M 1869. Mary E. K. Graham. 1951. 4p. diagr. (ARC R & M 2608; ARC 5831. Formerly RAE SME 3216)

Normal classical theory is somewhat complicated for design use, and this report describes a simple method for the use of designers: briefly, this is to estimate a straight-tapered wing equivalent to the wing under consideration, and to apply the results of R & M 1869 to determine its flutter characteristics. A graph is given, in which flutter speeds calculated by the classical theory for a number of typical airplane wings, are plotted against the speeds found by the use of the curves given in R & M 1869. The method strictly applies only to plain cantilever wings, but would probably give conservative results for wings with wing engines.

N-11526*

Aeronautical Research Council (Gt. Brit.)
THE CORRELATION OF AEROPLANE LOADING AND ACCIDENT STATISTICS. A. G. Pugsley. 1951. 5p. diagrs. (ARC R & M 2682; ARC 5922. Formerly RAE SME 3207)

The general problem is to predict the probable effect of a given change of structural strength upon the accident rate, the available data usually being in the form of rather meager loading and accident statistics together with a knowledge of the strength of the structure concerned. A method of treating this problem is given and is illustrated by an application to undercarriages. The method is simple and quick and requires no specialist knowledge of statistical mathematics.

N-11527*

Aeronautical Research Council (Gt. Brit.)
TURBULENCE CHANGES IN CONTRACTING AND DISTORTED PASSAGES. D. C. McPhail. 1951. 19p. diagrs. (ARC R & M 2437; ARC 7618. Formerly RAE Aero 1928)

Measurements of the root-mean-square turbulent velocity components were made in the contracting entrance to the working section of a small low turbulence wind tunnel and also in a passage with a cross section of varying shape but constant area. The 10:1 contraction ratio of the tunnel was successful in reducing the fractional intensity of the turbulent motion, but increased some of the transverse eddy dimensions. When the air stream was distorted with little change of speed, initially isotropic turbulence behaved in the anomalous manner observed in the wind-tunnel contraction; when the stream was subsequently allowed to flow uniformly, recovery of isotropy seemed to take place in an oscillatory fashion.

N-11528*

Aeronautical Research Council (Gt. Brit.)
THEORETICAL VELOCITY DISTRIBUTION IN A HIGH-SPEED TUNNEL CONTRACTION. M. Jones and P. Bright. 1951. 10p. diagrs. (ARC R & M 2601; ARC 9494. Formerly RAE Tech. Note Aero 1698)

By an arithmetical method, contours of constant Mach number have been determined in the contraction cone of a circular tunnel whose axial distribution of area was assumed to be the same as that in the Royal Aircraft Establishment High Speed Tunnel. The results show a definite tendency for the velocity to be lower on the center line than on the wall, the difference becoming smaller as the working section is entered. Sufficient work has been done to show that the method described can be used to obtain solutions for the flow of a compressible fluid in a pipe of varying cross section, provided that there are no discontinuities in the boundaries.

N-11529*

Aeronautical Research Council (Gt. Brit.)
A METHOD OF TESTING SMOOTH WINGS FOR INITIAL SHAPE AND RESISTANCE TO DISTORTION UNDER LOAD. J. C. King and D. H. Trollope. 1951. 14p. diagrs., photos. (ARC R & M 2531; ARC 8816. Formerly RAE SME 3327)

The development of special smooth wing constructions for laminar-flow airfoils calls for a simple testing technique to check the suitability of these new designs. In the method now used a short parallel length of wing bounded by ribs is tested under uniform bending with torsion and internal pressure superimposed when necessary. A standard specimen and standard testing technique are described. A review of the existing instruments for measuring surface irregularities is included.

N-11531*

Aeronautical Research Council (Gt. Brit.)
AN APPROXIMATION SIMPLIFYING WING FLUTTER CALCULATIONS. G. A. Naylor. 1951. 10p. diagrs., 6 tabs. (ARC R & M 2605; ARC 5830. Formerly RAE SME 3211)

Shows that the application of classical flutter theory to the determination of wing flexural-torsional flutter speeds is simplified by the omission of a term which is usually the very small difference between two small quantities. With this simplification a formula can be derived giving the critical speed explicitly in terms of the dynamical coefficients. Numerical examples show that this approximation gives almost the same flutter speeds as the complete classical theory. A simpler approximate formula is obtained by a combination of the first approximation with Pugsley's simplified theory; this approximation gives flutter speeds for normal wings which agree with those from classical theory.

N-11532*

Aeronautical Research Council (Gt. Brit.)
NOTES ON THE DESIGN OF CONVERGING CHANNELS. S. Goldstein. 1951. 14p. diagrs. (ARC R & M 2643. Formerly ARC 8495; FM 785; Ae.2737)

The design of two-dimensional converging channels is considered, with special reference to the lengths of the channels and the occurrence or absence of unfavorable velocity gradients at the walls. It is shown that it is not possible to have a short channel unless the velocity at the wall decreases at the beginning (the upstream end) of the channel; and it is further shown how a series of channels may be designed of decreasing lengths with increasingly unfavorable velocity gradients at the walls.

N-11533*

Aeronautical Research Council (Gt. Brit.)
CREEP TESTS ON SOME CAST MAGNESIUM ALLOYS. PARTS I, II AND III. A. E. Johnson and H. J. Tapsell. 1951. 22p. diagrs., tabs. (ARC R & M 2675; ARC 8281; ARC 8306. Formerly ARC 7595; ARC A. 459)

Results of creep tests of 150 hours duration at 100°, 150° and 200° C on some heat-treated sand cast magnesium alloys are presented. A comparison of the creep properties of three cast magnesium alloys based on tests of 1000 hours duration is made. Finally results are presented of short-time creep tests at 3 tons/sq in. of four cast magnesium alloys having different heat treatments.

N-11534*

Aeronautical Research Council (Gt. Brit.)
COMPARISON OF PUSHER AND TRACTOR PROPELLERS MOUNTED ON A WING. J. S. Thompson, R. Smelt, B. Davison and F. Smith. 1951. 18p. diagrs., 11 tabs. (ARC R & M 2516; ARC 4785. Formerly RAE BA 1614)

From model tests on pusher and tractor propellers mounted on a wing it is deduced that the presence of the wing reduces the efficiency of the pusher propeller and may increase the efficiency of the tractor propeller. These effects are of the same order of magnitude as the propulsive efficiency change due to forward movement of the transition point behind the tractor propeller, and should be included in any comparison of the efficiencies of the two types. The pusher propeller gives almost the same increase in maximum lift as the tractor, so there need be little difference in the take-off lift.

N-11535*

Aeronautical Research Council (Gt. Brit.)
A RESUMÉ OF AERODYNAMIC DATA ON AIR BRAKES: H. Davies and F. N. Kirk. 1951. 22p. diagrs., photos., 2 tabs. (ARC R & M 2614; ARC 5979. Formerly RAE Aero 1756)

A collection has been made of aerodynamic data on air brakes. The characteristics of wing brake flaps have been analyzed, including the effect of venting or perforating the flaps. The design of brake flaps so as to have no appreciable effect on lift or trim is discussed, and in this connection the relative merits of double split trailing-edge flaps, Youngman flaps, air brakes behind the tail, etc., are compared. A brief description of some methods of balancing brake flaps is given. The small amount of data available on wing and tail buffeting due to brake flaps has also been analyzed.

N-11536*

Aeronautical Research Council (Gt. Brit.)
INFLUENCE OF THE TESTING MACHINE ON THE FLEXURAL FAILURE OF PANELS. W. S. Hemp. 1951. 6p. diagrs. (ARC R & M 2539. Formerly ARC 9090; Strut 953)

The pin-ended length of a panel tested flat-ended in a compression testing machine is influenced by the flexibility of the machine. A system of elastic constants is defined to describe this influence and equations for the critical load developed. These constants are determined by stiffness measurements made on the testing machine and by calculation of the platten deformation at the area of contact with the panel. Finally, the degree of fixation achieved in the testing of typical panels is calculated and the results given in graphical form.

N-11537*

Aeronautical Research Council (Gt. Brit.)
THE RELATIVE STRENGTH AND STIFFNESS PROPERTIES REQUIRED FOR STRUT MATERIALS. A. G. Pugsley. 1951. 11p. diagrs. (ARC R & M 2490. Formerly ARC 10,235; Strut 1113)

Considers strength and stiffness properties required of a material for use in struts, taking as a measure of efficiency the weight of the uniform strut necessary to carry safely a given compression load P between two points distant L apart. Attention is given to the relative merits of increasing the equivalent yield stress p_y or the elasticity E of a given material. This depends on the slenderness ratio L/k adopted, which depends mainly on E/p_y for the material concerned and on the value of the structure loading coefficient P/L^2 compared with the stress p_y. Discusses reasons for the choice of particular slenderness ratios in practice.

N-11538*

Aeronautical Research Council (Gt. Brit.)
THE EFFECT OF INTERNAL PRESSURE ON THE INITIAL BUCKLING OF THIN-WALLED CIRCULAR CYLINDERS UNDER TORSION. H. G. Hopkins and E. H. Brown. 1951. 13p. diagrs., 2 tabs. (ARC R & M 2423; ARC 9538. Formerly RAE SME 3361)

Describes a theoretical investigation of the effect of internal pressure on the initial buckling of thin-walled circular cylinders under torsion. The effect is to increase the critical shear stress, decrease the circumferential wavelength, and increase the angle between the axis of the cylinder and the direction of the waves. There is little difference in the values of these quantities for clamped and simply supported edge conditions. Agreement between experimental and theoretical values of the critical shear stress is good. The increase in torsional stability with internal pressure is most marked.

N-11539*

Aeronautical Research Council (Gt. Brit.)
24-FT TUNNEL TESTS ON A HIGH-LIFT MODEL. DOWNWASH AND VELOCITY MEASUREMENTS AT THE TAILPLANE. C. H. Naylor. 1951. 7p. diagrs., photo. (ARC R & M 2649; ARC 5868. Formerly RAE Aero 1738)

The variation in downwash angle and velocity is such as to make the tailplane a destabilizing rather than a stabilizing member, at constant throttle with the flaps and slat in operation with the tailplane in any practicable position. This is due to the large downwash angles associated with the relatively low aspect ratio wing. The stability could be improved by the use of a higher-aspect ratio wing. The effect of slipstream on the complete airplane, however, is not necessarily destabilizing with flaps down because of the favorable effects of a high thrust line and of the slipstream velocity over the wing and flaps.

N-11540*

Aeronautical Research Council (Gt. Brit.)
REVISED HIGH-SPEED LIFT AND DRAG DATA FOR CLARK Y SECTIONS FOR PROPELLER PERFORMANCE CALCULATIONS. A. R. C. MacDougall. 1951. 17p. diagrs., 2 tabs. (ARC R & M 2474; ARC 10,502. Formerly RAE Aero 2177)

Revised drag data have been produced for Clark Y propeller blade sections thinner than 16 percent thickness/chord. These should supersede the data given in R & M 2036; also the range of incidence has been extended to cover small and negative angles for thin sections. Values obtained for the critical Mach number for drag are lower than those given earlier partly because in the present analysis allowance has been made for blade twist and partly because of the previous optimistic interpolations. No alterations have been made to the lift data given in R & M's 2036 and 2203.

N-11541*

Aeronautical Research Council (Gt. Brit.)
NOTES ON THE TAIL-FIRST AEROPLANE. S. B. Gates. 1951. 9p. diagrs. (ARC R & M 2676; ARC 4257. Formerly RAE BA 1542)

The tail-first airplane has certain strong attractions when combined with a tricycle undercarriage; in particular it has been suggested that it would represent a definite advance in the production of high lift. In these notes the main characteristics of a tail-first design are summarized and discussed, and an analysis is given of high-lift control with front and rear tails. It is shown that the high-lift claims made for the front tail are illusory in the present stage of development of high lift devices, owing to the high lift which the tail must provide to balance the high lift of the wing.

N-11542*

Aeronautical Research Council (Gt. Brit.)
PRELIMINARY NOTE ON THE USE OF LIGHT ALLOYS HAVING HIGH VALUES OF THE MODULUS BUT LOW PROOF STRESSES. H. L. Cox. 1951. 6p. diagrs., tab. (ARC R & M 2488; ARC 10,236)

Comparison is made between two extrusions, with moduli of 10 and 12.5 x 10^6 lb/in.^{2} and proof stresses of 74,000 and 51,000 lb/in.^{2} respectively; and between two sheets with moduli of 10 and 11.3 x 10^6 lb/in.^{2} and proof stresses of 58,000 and 45,000 lb/in.^{2} respectively. The comparison is based principally on the design of simple struts and plates, but some general comments on the design of stiffened panels are made. On the basis of these comparisons it may be estimated that the materials with increased values of the modulus should in lightly loaded cases result in weight saving of the order of 10 percent and that this saving should be chiefly with respect to the stiffening elements

N-11543*

Aeronautical Research Council (Gt. Brit.)
LOW-SPEED MODEL TESTS ON TWO "V" WINGS. J. Trouncer and D. Kettle. 1951. 86p. diagrs., photos., tab. (ARC R & M 2364)

Wind tunnel tests were required for comparison with flight tests on two "V" wing tailless gliders of 28.4° and 36.4° sweepback. The main part of the work consisted of longitudinal, lateral and directional stability tests on the two wings, but pressure-plotting tests on the wing of larger sweepback and an investigation of antitip stalling devices was also included. Tip slats were found to be the most effective of the devices tried in the present experiments for overcoming the drawback of the premature tip stall.

N-11708*

Aeroplane and Armament Experimental Establishment (Gt. Brit.) THE PERFORMANCE OF A SINGLE ROTOR HELICOPTER FOLLOWING POWER CUT WHILST HOVERING. FLIGHT TESTS WITH A HOVERFLY I NEAR THE GROUND. D. A. Wilkinson. September 26, 1951. 14p. diagrs., photos. (AAEE Rept. A.A.E.E./Res/259)

Engine cut tests were made on a Hoverfly I while hovering at heights up to 15 ft. from the ground. The effects on the subsequent performance of various manipulations of pitch were investigated and are discussed. Theoretical estimates were made of the variation of rotor speed and rate of descent following engine cut, and these are compared with observed data. A simple approximate formula is given for estimating the fall-off in rotor speed at constant blade pitch.

N-11714 *

Aeroplane and Armament Experimental Establishment (Gt. Brit.) VARSITY T. MK. 1 VX. 835 (2 x HERCULES 265). CLIMB AND LEVEL SPEED PERFORMANCE. August 13, 1951. 12p. diagrs., 4 tabs. (AAEE Rept. A. A. E. E. /873, pt. 14)

With a take-off weight of 37, 500 lb at max. continuous power (2400 rpm, + 9 lb/in^2 boost) for symmetric power the max. rate of climb was 1460 ft/min from sea level to 'M' gear full throttle height of 3, 500 ft and the service ceiling was 26, 800 ft; for asymmetric power (M gear only) the max. rate of climb was 180 ft/min from sea level to full throttle height of 3, 500 ft. For level speeds at 35, 600 lb (95 percent take-off weight of 37, 500 lb) for symmetric power the max. true airspeed at max. continuous power (weak mixture) (2400 rpm + 2 1/2 lb/in^2 boost) was 232 knots and at max. continuous power (2400 rpm + 9 lb/in^2 boost) 243 knots; for asymmetric power (M gear only) the max. true airspeed at max. continuous power was 159 knots.

N-11715*

Marine Aircraft Experimental Establishment (Gt. Brit.) ULTRA LIGHTWEIGHT MOORING FOR FLYING BOATS. V. N. Drake. June 1951. 14p. diagrs., photos. (MAEE Rept. FX/Eq/315)

Describes tests of a new mooring, designed by the Air Ministry Moorings Branch, employing nylon ropes and efficient anchors, which should be suitable for flying boat use and will weigh only about 800 lb. The trials consisted only of handling, and of endurance of the mooring when not mooring an aircraft. Some slight development is required before the mooring is further tested by use in rough weather, but in general it appears to be promising.

N-11717*

Royal Aircraft Establishment (Gt. Brit.) TECHNICAL NOTES ON MINIATURE RECORDER TYPES A20, A21, A22 AND ACCESSORIES. June 1951. 25p. diagrs., photos. (RAE Library Trans. 376. Trans. from Societé de Fabrication d'Instruments de Mesure, Paris. Notices Techniques 13, 15-20, 22, 1949).

This is a translation of technical notes issued by the Société de Fabrication d'Instruments de Mesure, concerning the Hussenot recorder and some of the elements used in conjunction with it. The recorder is small and compact. The recording elements are interchangeable and up to six channels may be recorded continuously, together with three independent event markers. Each element is provided with a small mirror reflecting a beam of light which is focused to a spot on a narrow slit behind which the recording paper is passed.

N-11718 *

Royal Aircraft Establishment (Gt. Brit.) IMPROPER INTEGRALS IN THEORETICAL AERODYNAMICS. K. W. Mangler. June 1951. 35p. diagrs. (RAE Aero 2424)

Deals with an integral involving a "principal-value", which was initiated by Hadamard and is a generalization of Cauchy's principal value. The rules for evaluation, the differentiation and integration by parts of such an integral are derived and summarized, together with a theorem, which will be useful to workers in the field of theoretical aerodynamics.

N-11722*

Royal Aircraft Establishment (Gt. Brit.) GRADED DENSITY FILTERS. K. Parnham. July 1951. 13p. diagrs., tab. (RAE Tech. Note Ph. 446)

Even illumination of the focal plane of a photographic lens can be obtained by applying a suitable coating of neutral density material to a filter placed either in front of the lens or in the focal plane. The theoretical density requirement is discussed for both cases and it is shown that a full correction can only be obtained by coating the rear surface of the register glass but that this method has serious disadvantages. A before-lens filter, having a central density as low as 0. 3 can be designed to give a sufficiently good correction if a rapid fall off in the extreme corners of the picture can be tolerated.

N-11726*

Royal Aircraft Establishment (Gt. Brit.) THE GENERAL INSTABILITY OF CIRCULAR CYLINDRICAL SHELLS, REINFORCED WITH FRAMES AND STRINGERS - A REVIEW FROM THE STANDPOINT OF THE DESIGNER. J. H. Shelley. August 1951. 36p. diagrs., 3 tabs. (RAE Tech. Note Structures 76)

The object of this report is to present the subject of general instability of reinforced cylinders from the designers standpoint, and the field reviewed is thus almost entirely confined to the methods and results of the American workers - at the Guggenheim Aeronautical Laboratory of the California Institute of Technology, and the Polytechnic Institute of Brooklyn. The methods now available for the assessment of a stiffened cylindrical shell from the general instability standpoint are summarized and discussed, and numerical examples are given.

N-11727*

Ministry of Supply (Gt. Brit.) THE EFFECT OF GRAIN DIRECTION ON THE MECHANICAL PROPERTIES OF LIGHT ALLOY EXTRUSIONS. Compiled by D. M. McElhinney. 64p. diagrs., photos., 18 tabs. (MOS S & TM 14/51; Metropolitan-Armstrongs, Ltd., Weybridge. VTO/M/208)

The results of a series of tests on specimens made from light alloy extruded bars of large cross-sectional area are presented to show the effect of grain direction on the mechanical properties. The effect of stress concentrations on strength in the various grain directions is also shown. The influence of grain direction on lugs and pin shear is likewise indicated from test results.

N-11752*

Royal Aircraft Establishment (Gt. Brit.)
THE VARIATION IN PERFORMANCE OF UNDERCARRIAGE SHOCK ABSORBERS. H. G. Spurr. October 1951. 14p. diagrs., 9 tabs. (RAE Tech. Note Structures 77)

This note gives the results of drop tests made to investigate the variation in performance of undercarriage shock absorbers. Twenty Spitfire undercarriages of two different types were used. An analysis is made of the variations in acceleration and shock absorber closure under different conditions. These variations are shown to be wider between nominally identical undercarriages than between different drops of the same undercarriage. They increase when additional friction is caused by non axial loading.

N-11755*

Royal Aircraft Establishment (Gt. Brit.)
A PRELIMINARY ANALYSIS OF SOME RECENT FILM BASE DISTORTION FIGURES. R. Hall. July 1951. 25p. diagrs. (RAE Tech. Note Ph. 451)

Previous methods of analyzing measurements of film base distortion have proved unsatisfactory when applied to normal survey film. In this note analytical methods are given which appear to indicate a law obeyed by film as it expands or contracts after processing. This empirical law might form the basis of a method of correction to be applied during the printing of diapositives used for the actual survey measurements.

N-11757*

Royal Aircraft Establishment (Gt. Brit.)
HELICOPTER ROTOR BEHAVIOUR AFTER ENGINE FAILURE IN FORWARD FLIGHT. W. Stewart and M. F. Burle. August 1951. 22p. diagrs., tab. (RAE Tech. Note Aero 2119)

Calculations have been made to find the changes in rotor speed following engine failure in forward flight. Several particular examples were investigated based on the parameters of the S-51 helicopter. The effect of pilot's control movement was included. A rapid loss of rotational speed occurs with practically no change in forward speed of the helicopter, thus the tip speed ratio increases rapidly. This may lead to stalling of the retreating blade and/or interference of the blades with the droop stops.

N-11822*

National Gas Turbine Establishment (Gt. Brit.)
ESTIMATION OF THE CHANGE IN PERFORMANCE CHARACTERISTICS OF A TURBINE RESULTING FROM CHANGES IN THE GAS THERMODYNAMIC PROPERTIES. D. G. Ainley. June 1951. 20p. diagrs., tab. (NGTE Memo. M. 118)

Frequently turbines are tested in a laboratory with cool air which has thermodynamic properties different from those of the hot gas for which the turbine is designed. This note presents methods for correcting such tests to allow for a difference in gas thermodynamic properties.

UNPUBLISHED PAPERS

N-1716*

ON THE PROBLEM OF SOLUTION OF THE FLIGHT-MECHANICAL EQUATIONS OF MOTION WITH ASSUMPTION OF UNSTEADY AIR FORCES. (Zur Frage der Lösung der flugmechanischen Bewegungsgleichungen bei instationären Luftkraftansätzen). H. Sohngen. November 1951. 16p. diagrs., tab. (Trans. from Lilienthal-Gesellschaft für Luftfahrtforschung, Berlin, Bericht 143, November 6-7, 1941, p. 10-14).

It is shown for the case of a free rudder with fixed fin how the first three to four oscillations of a rudder after a disturbance can be determined with use of the air force moment as yielded by the theory of unsteady movements. A comparison of the results thus obtained with those of known approximation methods is made.

N-2331*

ON THE CONVERGENCE OF THE METHOD OF SHVETS. (O Skhodimosti Metoda Shvetsa). L. S. Gandin. 6p. (Trans from Prikladnaya Matematika i Mekhanika, v. 14, 1950, p. 441-443).

The question of the possibility of a proof of convergence of the method of M. E. Shvets (NACA TM 1286) for certain types of problems is presented in this paper. The convergence of this method is proven for the simplest problem of those considered in NACA TM 1286.

N-9179*

ON THE CALCULATION OF THE PROFILE DRAG. (Zur Berechnung des Profilwiderstands). H. B. Helmbold. November 1951. 14p. tab. (Trans. from Ingenieur-Archiv, v. 17, 1949, p. 273-279).

This report shows that by suitable balancing of the empirical and theoretical constants occurring in the boundary-layer calculations, the potential velocity at the rear end of the body which is not easily estimated may be removed from the drag calculation entirely, and a very clearly arranged drag formula may be obtained.

UNIVERSITY OF FLORIDA
3 1262 09079 7324

N-9809 *

SONIC FIELD PRODUCED BY A POINT SOURCE IN UNIFORM RECTILINEAR MOTION IN A PERFECT FLUID, ESPECIALLY IN THE CASE OF A SUPERSONIC VELOCITY. (Champ Sonore Produit par Une Source Ponctuelle en Mouvement Rectiligne Uniforme Dans un Fluide Parfait, Spécialement Dans le Cas D'une Vitesse Supersonique). P. Liénard. 20p. diagrs. (Trans. from La Recherche Aéronautique, no. 10, July-August 1949, p. 43-51).

If a sonic source is displaced at a supersonic velocity, the pressure at each interior point of the sonic cone is the sum of two pressures, different in amplitude, phase, and direction of propagation. To an observer fixed with respect to the source, these two pressures oscillate with the same frequency. A study of the location of relative maximum and minimum pressures of equal mean square pressure and of equal phase is made. An observer in motion relative to the source perceives, in general, for each frequency emitted, two different variable frequencies. A study is made of the particular cases where these frequencies reduce to a single one, variable or constant. Application is made to the determination of the speed of supersonic aircraft.

N-12324*

NUMERICAL INTEGRATION OF DIFFERENTIAL EQUATIONS. (Sbornik Statei Po Chislennomu Integrirovaniyu Diferentsial'nyky Uravnenii). V. P. Vetchinkin. 77p. diagrs., 8 tabs. (Trans. from Central Aero-Hydrodynamical Institute, Transactions. No. 273, 1936, p. 1-60)

The present work is devoted to the further development of methods of the numerical integration of ordinary differential equations and systems of equations. The work consists of several papers devoted to the method of Runge-Kutta, the method of Cowell, and the approximate or numerical solution of boundary problems that reduce to the integration of ordinary differential equations.

N-12412 *

LONGITUDINAL STABILITY OF A SINGLE-STEP HIGH-SPEED BOAT IN STILL WATER. (Dannashi kosokutei no heisuichu ni okeru juantei ni tsuite). S. Inoue. 8p. diagr. (Trans. from Kyushu Imperial Univ., Research Institute for Fluid Engineering, Repts., v. 3, no. 3, Dec., 1947, p. 55-59).

The theory of longitudinal stability of the steady motion of a high-speed boat in still water has been investigated by Perring and others. Peering's method of calculating the resistance derivatives applies to the pure planing condition. For a speed that is actually not too high, the calculated stability condition does not correspond to the actual stability. The disagreement of this calculation with experimental results may be due to the failure to consider the effect of gravity. In this report experimental results obtained by Sottorf on a planing plate in which the effect of gravity is considered are used.

N-12421*

RESISTANCE OF CASCADE OF AIRFOILS IN VISCOUS INCOMPRESSIBLE FLUID. (Soprotivlenie Reshetki Profilei Obtekaemoi Viazkoi Neszhimaemoi Zhidko st'iu). L. G. Loitsiansii. 19p. diagrs. (Trans. from Prikladnaya Matematika i Mekhanika, v. 11, no. 4, 1947, p. 449-458).

An approximate solution is given herein for the problem of the resistance of a two-dimensional infinite cascade; the solution is based on the assumption of a slight degree of nonhomogeneity of the velocity field in the section of the wake behind the cascade where the neighboring boundary layers merge. In deriving the final formulas for the resistance, use is made of the idea of reducing the characteristic magnitudes in the aerodynamic wake at a great distance behind the body to the corresponding magnitudes at the trailing edge of the body.

N-12422*

VARIATIONAL METHODS FOR THE SOLUTION OF PROBLEMS IN ELASTICITY. (Variatsionnve Metody Resheniya Zadach Teorie Uprugosti). L. S. Leibenzon. 456p. diagrs. (Trans. from Russian book, 1943).

Gives a description of the variational method and its application to the solution of a number of problems of interest for geophysics, structural mechanics, and aeronautics. In accordance with the practical aim of the present work, the purely mathematical side of the variational method has not been considered. In addition to the variational methods of Galerkin, Ritz, and Timoshenko, the recently proposed method of "relaxation of the boundary conditions," the fundamental idea of which is also the so-called principle of Saint-Venant, has also been considered. The last part is devoted to application of the variational methods of solution to problems of torsion and bending of beams in aeronautical structures.

N-12428*

ON THE PROBLEM OF UNDERWATER WINGS FOR SHIP PROPULSION. (Voprosu o Dvizhenii po Vode na Podvodnykh Krylyakh). U. U. Benua. 14p. diagrs. (Trans. from Sudostroenie, v. 8, no. 7, July 1938, p. 92-97).

In this paper the author proposes a scheme for mounting underwater wings on small boats whereby stability in both the longitudinal and transverse directions may be obtained.

NACA-Langley - 1-24-52 -4000